FIG. 1

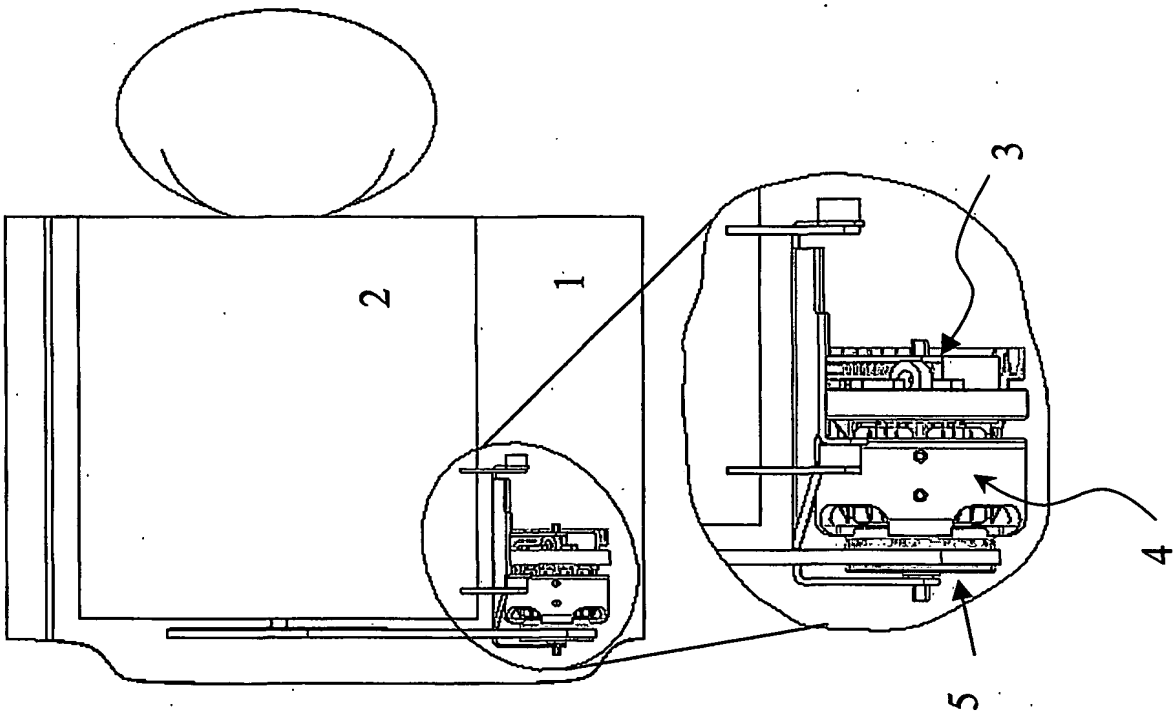


FIG. 3

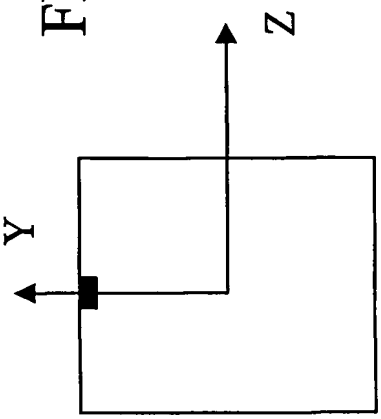


FIG. 5

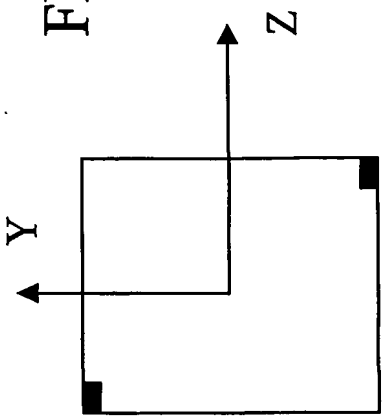


FIG. 2

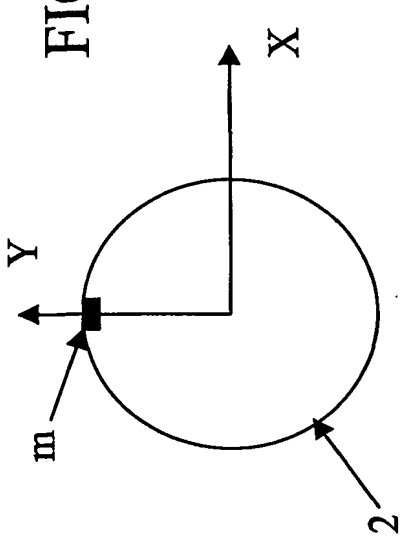


FIG. 4

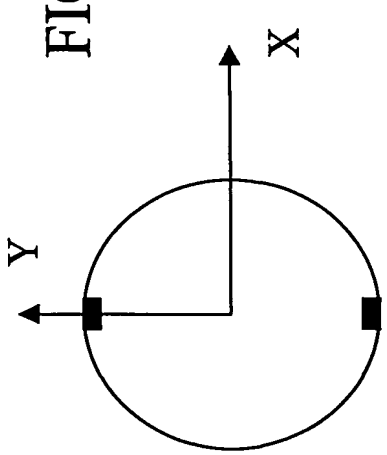


FIG. 7

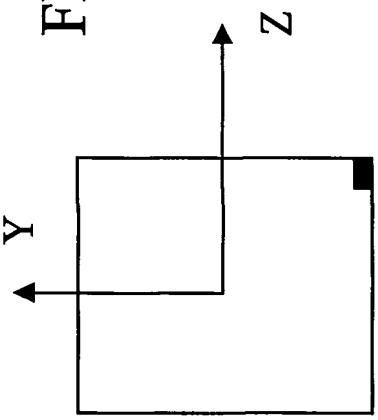


FIG. 9

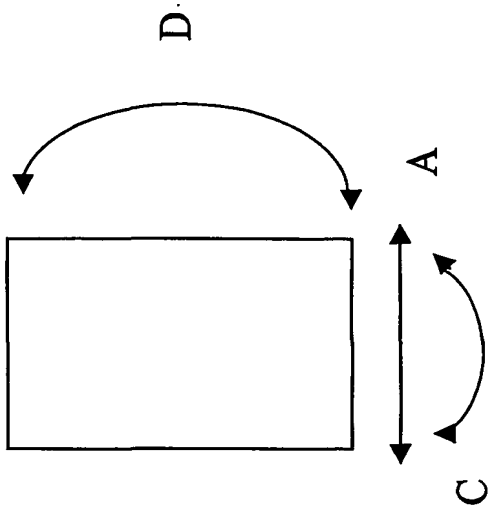


FIG. 6

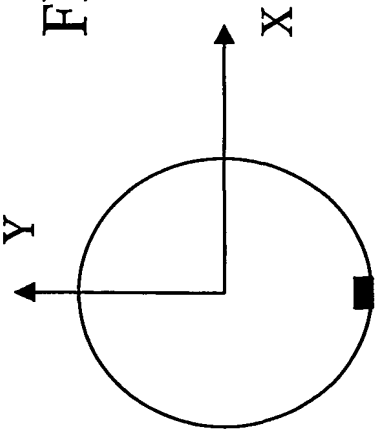
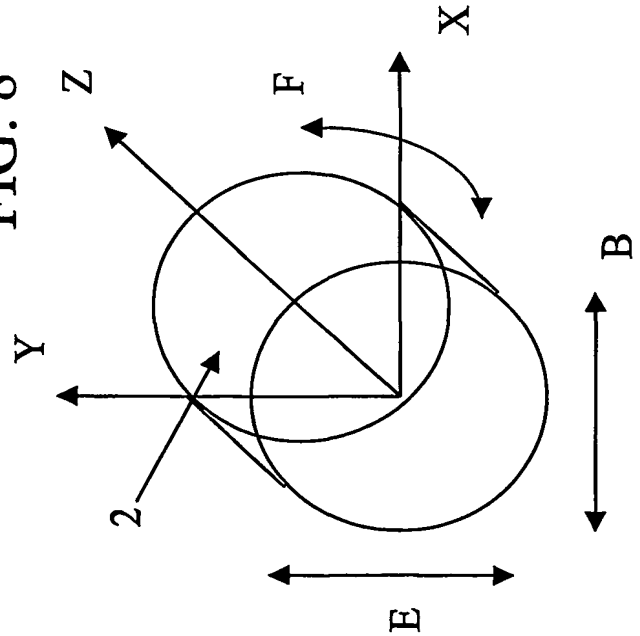


FIG. 8



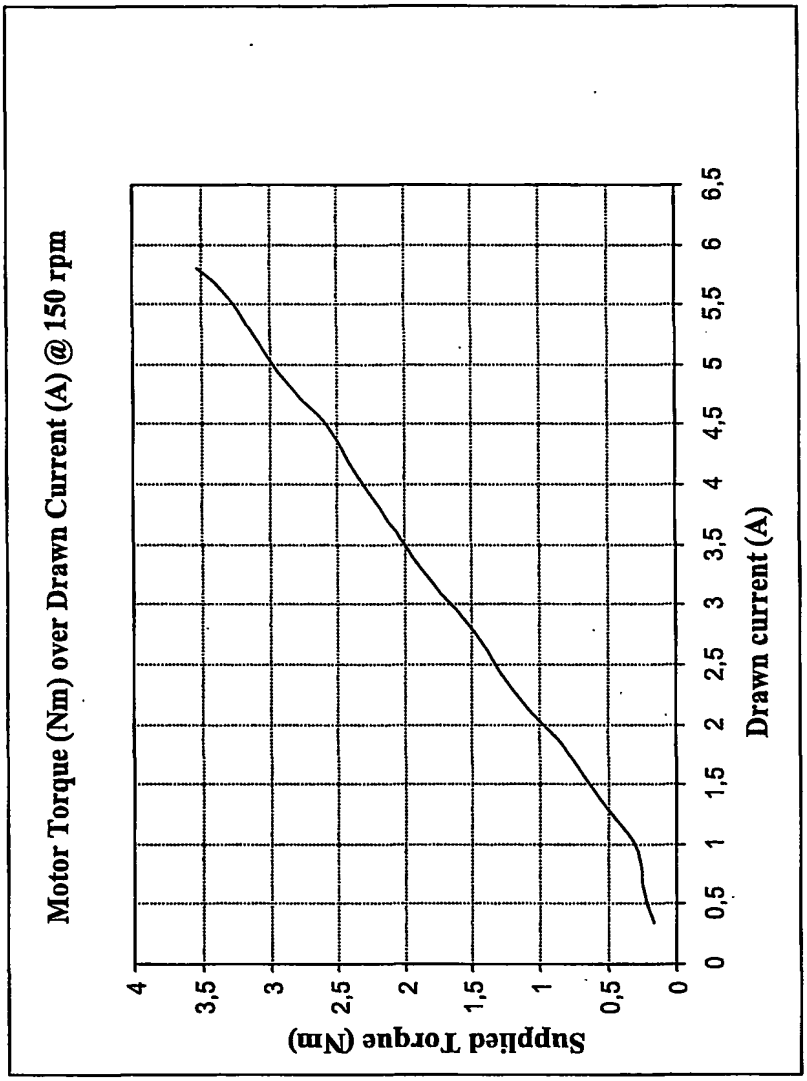

Motor Torque (Nm) over Drawn Current (A) @ 150 rpm
Supplied Torque (Nm)
0
0,5
1
1,5
2
2,5
3
3,5
4
Drawn current (A)
0
0,5
1
1,5
2
2,5
3
3,5
4
4,5
5
5,5
6
6,5

FIG. 10

FIG. 11

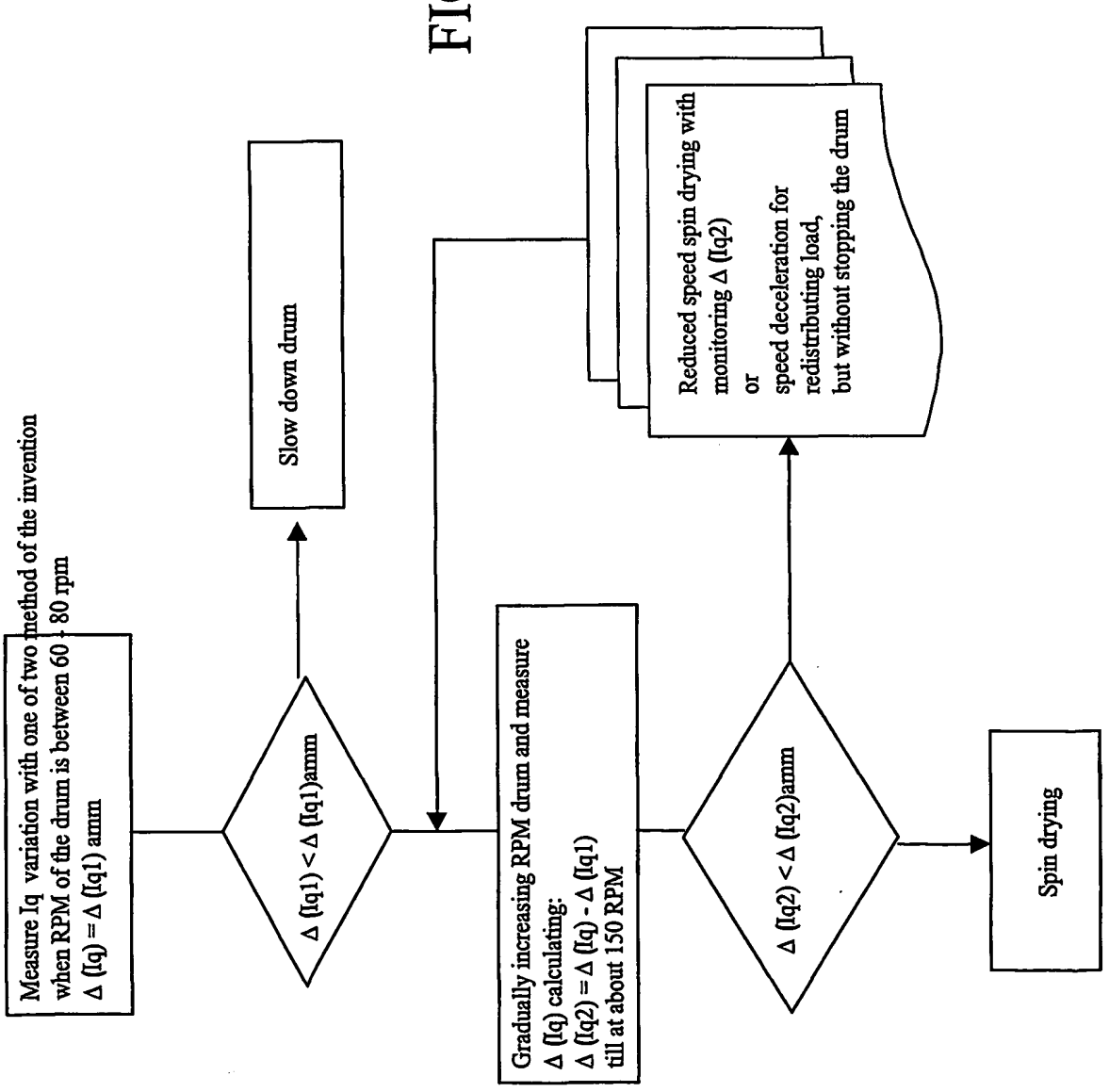

Measure Iq variation with one of two method of the invention when RPM of the drum is between 60 - 80 rpm
Δ (Iq) = Δ (Iq1) amm
Δ (Iq1) < Δ (Iq1)amm
Slow down drum
Gradually increasing RPM drum and measure
Δ (Iq) calculating:
Δ (Iq2) = Δ (Iq) - Δ (Iq1)
till at about 150 RPM
Reduced speed spin drying with monitoring Δ (Iq2)
or
speed deceleration for redistributing load,
but without stopping the drum
Δ (Iq2) < Δ (Iq2)amm
Spin drying

FIG. 12

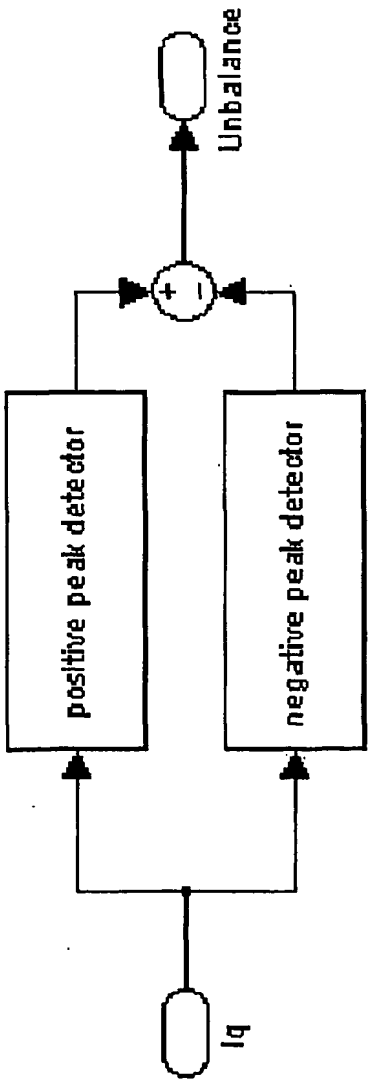
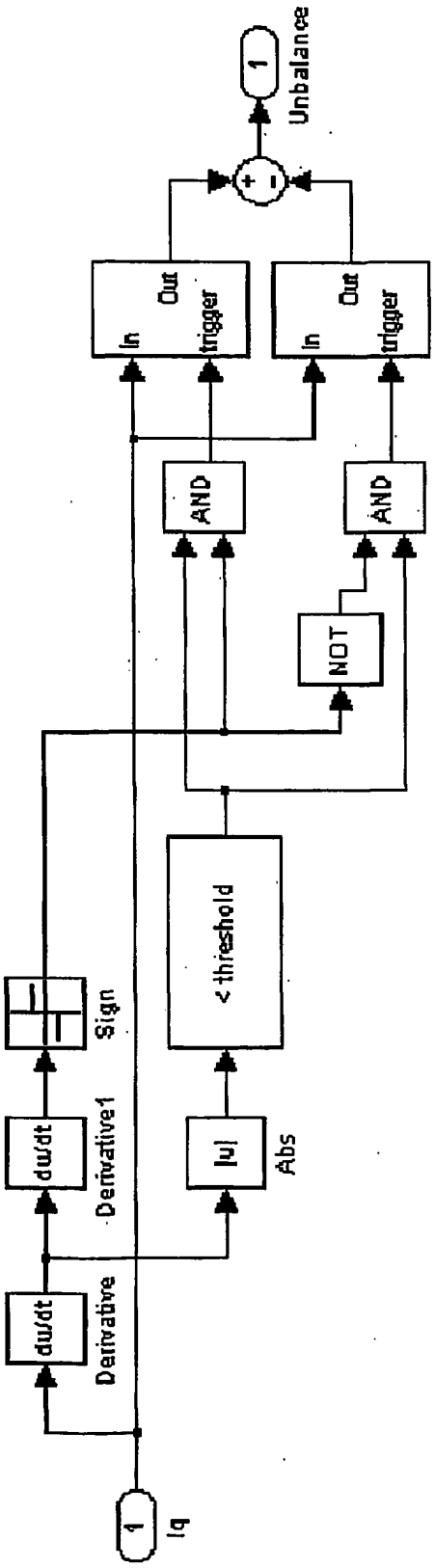

Unbalance
+
-
positive peak detector
negative peak detector
Iq

FIG. 13


1
Unbalance
+
-
In
Out
trigger
In
Out
trigger
AND
AND
NOT
< threshold
Sign
du/dt
Derivative1
|u|
Abs
du/dt
Derivative
1
Iq